

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization International Bureau



(43) International Publication Date
1 September 2005 (01.09.2005)

PCT

(10) International Publication Number
WO 2005/079353 A3

(51) International Patent Classification⁷:
1/24, H05K 3/00

H01B 1/22,

(74) Agent: WHITHAM, Michael, E.; Whitman, Curtis & Christofferson, PC, 11491 Sunset Hills Road, Suite 340, Reston, VA 20190 (US).

(21) International Application Number:

PCT/US2005/004567

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 14 February 2005 (14.02.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/545,139 18 February 2004 (18.02.2004) US

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (for all designated States except US): VIRGINIA TECH INTELLECTUAL PROPERTY, INC. [US/US]; 1872 Prat Drive, Blacksburg, VA 24060 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): LU, Guo-Quan [US/US]; 107 Vinyard Avenue, Blacksburg, VA 24060 (US). BAI, John, G. [CN/US]; 1776 Liberty Lane, Apt. B23, Blacksburg, VA 24060 (US). CALATA, Jesus, N. [PH/US]; 1507 Poplar Ridge Circle, Blacksburg, VA 24060 (US). ZHANG, Zhiye [CN/US]; 400 New Kent Road, #711, Blacksburg, VA 24060 (US).

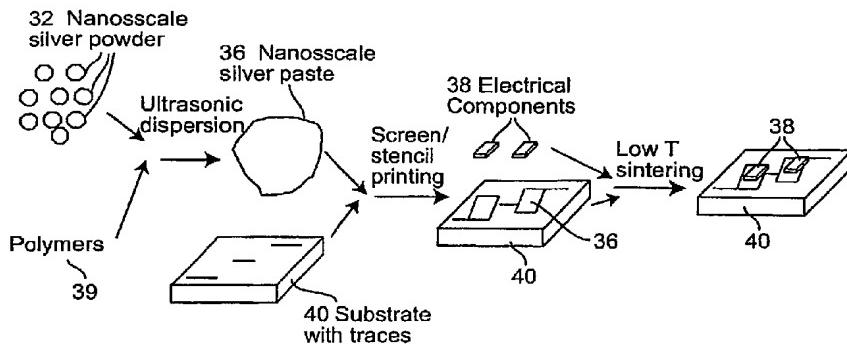
Published:

— with international search report

(88) Date of publication of the international search report:
8 December 2005

[Continued on next page]

(54) Title: NANOSCALE METAL PASTE FOR INTERCONNECT AND METHOD OF USE



(57) Abstract: A paste including metal or metal alloy particles (which are preferably silver or silver alloy), a dispersant material, and a binder is used to form an electrical, mechanical or thermal interconnect between a device and a substrate. By using nano scale particles (*i.e.*, those which are less than 500 nm in size and most preferably less than 100 nm in size), the metal or metal alloy particles can be sintered at a low temperature to form a metal or metal alloy layer which is desired to allow good electrical, thermal and mechanical bonding, yet the metal or metal alloy layer can enable usage at a high temperature such as would be desired for SiC, GaN, or diamond (*e.g.*, wide bandgap devices). Furthermore, significant application of pressure to form the densified layers is not required, as would be the case with micrometer sized particles. In addition, the binder can be varied so as to insulate the metal particles until a desired sintering temperature is reached; thereby permitting fast and complete sintering to be achieved.

WO 2005/079353 A3



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.